



Published in final edited form as:

Am J Public Health. 2015 April ; 105(4): 802–809. doi:10.2105/AJPH.2014.302105.

Efficacy of an Adapted HIV and Sexually Transmitted Infection Prevention Intervention for Incarcerated Women: A Randomized Controlled Trial

Catherine I. Fogel, PhD, RNC, FAAN, Jamie L. Crandell, PhD, A. M. Neevel, BA, Sharon D. Parker, MSW, PhD, Monique Carry, PhD, Becky L. White, MD, Amy M. Fasula, MPH, PhD, Jeffrey H. Herbst, PhD, and Deborah J. Gelaude, MA

Catherine I. Fogel, Jamie L. Crandell, A. M. Neevel, and Sharon D. Parker are with the School of Nursing, and Becky L. White is with the Division of Infectious Diseases, Department of Medicine, University of North Carolina at Chapel Hill (UNC). Monique Carry, Amy M. Fasula, Jeffrey H. Herbst, and Deborah J. Gelaude are with the Prevention Research Branch, Division of HIV/AIDS Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, Centers for Disease Control and Prevention (CDC), Atlanta, GA.

Abstract

Objectives—We tested the efficacy of an adapted evidence-based HIV–sexually transmitted infection (STI) behavioral intervention (Providing Opportunities for Women’s Empowerment, Risk-Reduction, and Relationships, or POWER) among incarcerated women.

Methods—We conducted a randomized trial with 521 women aged 18 to 60 years in 2 correctional facilities in North Carolina in 2010 and 2011. Intervention participants attended 8 POWER sessions; control participants received a single standard-of-care STI prevention session. We followed up at 3 and 6 months after release. We examined intervention efficacy with mixed-effects models.

Results—POWER participants reported fewer male sexual partners than did control participants at 3 months, although this finding did not reach statistical significance; at 6 months they reported significantly less vaginal intercourse without a condom outside of a monogamous relationship and more condom use with a main male partner. POWER participants also reported significantly fewer condom barriers, and greater HIV knowledge, health-protective communication, and tangible social support. The intervention had no significant effects on incident STIs.

© 2014 American Journal of Public Health

Correspondence should be sent to Catherine I. Fogel, PhD, RNC (WHCNP), FAAN, Professor, School of Nursing, The University of North Carolina at Chapel Hill, Carrington Hall, CB #7460, Chapel Hill, NC 27599-7460 (cfogel@e-mail.unc.edu). Reprints can be ordered at <http://www.ajph.org> by clicking the “Reprints” link.

Contributors

C. I. Fogel, J. H. Herbst, and D. J. Gelaude prepared the first draft of the article and edited revised drafts. J. L. Crandell was lead statistician, prepared the description of the results, and generated the data tables. A. M. Neevel, S. D. Parker, M. Carry, B. L. White, and A. M. Fasula helped compose the article and reviewed and edited drafts.

Human Participant Protection

The study protocol was approved by the institutional review boards of UNC and the North Carolina Department of Corrections.

Conclusions—POWER is a behavioral intervention with potential to reduce risk of acquiring or transmitting HIV and STIs among incarcerated women returning to their communities.

Women accounted for 20.8% of all US adults and adolescents diagnosed with HIV in 2011.¹ Women's risk of HIV infection is attributable to a confluence of factors, including unprotected vaginal and anal intercourse, injection drug or substance use, lack of awareness of sexual partners' risk behaviors, sexual abuse and violence, and a history of sexually transmitted infections (STIs).²

Incarcerated women experience high rates of HIV and STIs.^{3–5} In 2010, 1.9% of incarcerated adult women were HIV positive. This rate of HIV infection was nearly 13 times as high as among the general population of adult women (0.15%) in the United States.⁶ In 2010, the rates of gonorrhea and chlamydia among adult incarcerated women were 1.9% and 6.9%, respectively; these were the highest rates observed among women in any venue.⁷ Furthermore, an estimated 22 723 HIV-infected women in the United States are released from a correctional facility annually, suggesting an important opportunity for HIV–STI prevention.⁸ The HIV–STI risk reduction needs of incarcerated women are complex because of myriad factors, including high levels of mental health issues; illicit substance use; poor social support systems; history of sex work; previous and current physical, sexual, and emotional abuse from male partners; and issues pertaining to prison release and reentry into communities of origin.^{9–15} Community reentry is a vulnerable time for women and is associated with increases in sexual risk, substance use, and recidivism.¹⁶

The risk profile of incarcerated women indicates that prisons and jails are important settings for prevention interventions that can be delivered in a relatively short time.¹⁷ However, HIV–STI prevention interventions delivered to women in prisons and jails are limited.^{18–20} Despite incarcerated women's significant level of risk, no efficacious behavioral HIV–STI risk reduction interventions target them and facilitate their transition from prisons to communities.²¹

To address this critical gap, we adapted an existing evidence-based HIV–STI prevention intervention, SAFE (Sexual Awareness for Everyone), for incarcerated women.²² SAFE is a small-group motivational and skills-building intervention shown to be efficacious in reducing risky sexual behaviors and incident nonviral STIs among minority women diagnosed with STIs in public health clinics.^{23,24} We selected SAFE for adaptation because the intervention addresses prevention themes relevant for women prisoners, including awareness of personal risk, sexual behavior risk reduction, reduction in numbers of partners, and acquisition of skills such as communication with sexual partners.²² We followed a systematic adaptation process²⁵ in creating Providing Opportunities for Women's Empowerment, Risk-Reduction, and Relationships (POWER) to address the sexual risk reduction needs of women in prison.²² We incorporated themes not specifically addressed by SAFE, such as the role of substance abuse in HIV risk, implications of sex work as a risk behavior, impact of violence on risk reduction efforts, and barriers to incorporating risk reduction upon community reentry.²²

Our study was part of the Adopting and Demonstrating the Adaptation of Prevention Techniques (ADAPT-2) project, which systematically adapts and tests the efficacy of evidence-based HIV behavioral interventions for populations at highest risk of HIV acquisition or transmission.²⁶ We assessed the efficacy of POWER to reduce incident nonviral STIs and sexual risk behaviors and increase risk reduction practices among women in 2 correctional facilities in North Carolina.

METHODS

Recruitment and enrollment took place between September 2010 and November 2011 in the North Carolina Correctional Institute for Women in Raleigh and the Fountain Correctional Center for Women in Rocky Mount. The North Carolina Correctional Institute for Women is the state's primary processing facility and largest women's prison; it houses more than 1100 inmates. Fountain Correctional Center for Women is a minimum security prison housing more than 500 inmates. All women enter the larger facility and are tested for STIs, including HIV, during intake. Women who test positive for an STI are treated prior to assignment to a specific prison. All HIV-infected women are linked to care and treatment.

We identified newly incarcerated women in the North Carolina Department of Corrections (NCDOC) database who had a sentence length of 12 months or less. Prison staff reviewed the names and excluded women with documented symptoms of acute psychosis. Eligibility criteria were speaking English, being 18 years or older, being able to provide verbal and written consent, planning to live in North Carolina for the length of the study, having had or expecting to have sexual activity with a man, being HIV negative, and having less than 6 months to serve. Among 820 women screened, 172 refused to participate, 106 did not meet eligibility criteria, 16 were transferred to a nonparticipating prison, 3 initially expressed interest but dropped out prior to randomization, and 2 were removed at the prison's request (Figure A, available as a supplement to the online version of this article at <http://www.ajph.org>). The final sample comprised 521 women.

Prior to the start of the study, we generated a randomization sequence and placed each participant's assignment in a sealed opaque envelope. This allowed the interviewer to remain blinded during the baseline assessment. After we obtained written and signed informed consent from each study participant, we conducted a baseline interview in a private room without prison staff present. We read all questions (and those for subsequent interviews) to the participants with the aid of audio computer-assisted self-interviewing software to increase comprehension for women with low literacy. After the interview, the interviewer opened the envelope and described the participant's assignment to either the POWER (n = 265) or control (n = 256) study arm. We collected follow-up data 3 and 6 months after release from prison. We conducted post-release interviews in private settings of participants' choosing, such as their home or a fast food restaurant.

Women received snacks during the POWER sessions. Because NCDOC regulations prohibit provision of money or other tangible reimbursements to incarcerated persons, we mailed a cosmetic case containing condoms, lubricant, and body lotion to all study participants after

their release. All study participants received a total of \$60 (\$30 per interview) for completing the 3- and 6-month postrelease interviews.

Interventions

Formative research to adapt SAFE for women prisoners is described elsewhere.^{22,27} Briefly, we conducted semistructured interviews with 25 newly incarcerated and 28 formerly incarcerated women to explore how individual, interpersonal, and societal factors contribute to sexual risk behavior before incarceration and after release.²⁸ We also discussed women's ideas regarding factors that influence risky behaviors and recommendations for risk reduction interventions for incarcerated women. For example, women identified the importance of receiving mentoring from previously incarcerated peers; however, opportunities for in-person peer mentoring are limited by prison policies restricting access to inmates. To address this restriction, we developed 8 video segments of 4 to 5 minutes from interviews with formerly incarcerated women and interspersed them throughout the POWER sessions to convey information, inspire participants, and prompt discussion.²²

The AIDS Risk Reduction Model provided the theoretical basis for SAFE, and POWER incorporates the 3 main stages of the model: (1) recognizing one's risk, (2) commitment to reducing that risk, and (3) following through with the commitment by seeking solutions.²⁹ POWER addresses stage-specific needs and includes knowledge of disease transmission, recognition of personal risk, perception of the costs and benefits of behavioral change, self-efficacy, and attainment of skills.

A nurse and a social worker facilitated POWER in the 2 prisons. We developed a POWER training manual (available from C. I. F.) to guide intervention delivery and ensure fidelity to the curriculum. All facilitators were female, had advanced training in health education, and served as an assistant facilitator 1 time prior to leading their own intervention sessions. Facilitators also completed a mandatory training session with NCDOC personnel, which addressed prison rules, regulations, appropriate dress and behavior while in the prison, and how to address self-reported sexual assault.

POWER consists of 8 interactive group sessions lasting 1.5 hours, delivered over 4 weeks.²² The content of the first 6 sessions is similar to SAFE, and the last 2 sessions are tailored to incarcerated women. Session 1 introduces the purpose of the intervention, presents the facts of HIV–STIs for women in general and women prisoners specifically, and dispels myths about assessing personal risk. Session 2 introduces the importance of self-protection, individual strength, and ability to care for oneself; examines behaviors that place one at risk; and presents specific signs and symptoms of HIV and STIs, including graphic pictures of disease manifestations. Session 3 focuses on substance abuse; HIV–STI prevention practices; partner information; specifics of condoms, including how to use male and female versions; and cleaning drug paraphernalia.

Session 4 explores female sexuality and sexual roles for women, what women need and want in a relationship, and sexual decision-making. Session 5 discusses male–female interaction and relationships, including sexual communication role playing and identifying triggers to unsafe sex. Session 6 explores violence, particularly intimate partner violence,

and depression as risk factors and teaches strategies for decreasing risk. Session 7 focuses on preparing for reentry, going home, setting goals, identifying and contacting a support person, and finding out where resources can be obtained after release. Session 8 reviews condom negotiation and use, including role-playing specific situations; issues to negotiate before going home; and setting goals for oneself. This session also includes a graduation ceremony.

POWER includes a booster session delivered 1 month after session 8 and prior to release; the time to release varied in our study. The booster session reviews what was learned during previous sessions and helps women prepare for reentry into the community, including completing job applications. Three 5-minute booster phone calls were delivered after release. During each phone call we reviewed women's sexual health and reentry plans, provided referrals to requested services, and checked on risk reduction efforts, including condom use. The phone calls occurred, on average, 21, 51, and 80 days after release, and nearly half (48.7%) of the 265 women assigned to POWER received at least 1 phone call.

The control arm received a single, 1-hour NCDOC standard-of-care STI education session that included basic information on STI transmission, sexual abstinence, and condom use. An NCDOC nurse delivered the session, provided to all women in the prison, including POWER participants, during the first 3 months of incarceration.

Outcome Measures

Primary outcomes were nonviral STI infections (chlamydia and gonorrhea) and sexual risk behaviors assessed 3 and 6 months after release. We measured STIs by nucleic acid amplification testing from self-collected vaginal swabs. At each interview, we asked participants about their sexual risk activities either prior to incarceration (baseline interview) or over the past 3 months (follow-up interviews).³⁰ Behavioral risk outcomes were number of unprotected vaginal sexual acts without a condom, number of male sexual partners, partner concurrency (i.e., having vaginal intercourse with > 1 man), drug use before sexual intercourse, and sexual intercourse traded for money or drugs. We assessed condom use during vaginal intercourse over the past 3 months separately for main and nonmain male partners. If women did not report a main or nonmain sexual partner at baseline, we excluded them from analyses of condom use. Data on sexual partner concurrency and use of condoms with different types of partners included number of concurrent partners, beliefs regarding partner's other partners, and overlapping relationships.³¹ We incorporated these behaviors into the outcome whether women engaged in unprotected vaginal intercourse in a nonmonogamous relationship (defined as vaginal intercourse without condoms with someone who was not their main partner) or with a main partner who was not monogamous.

Secondary outcomes were self-reported use of any illegal drug and employment status. Although the intervention was not designed specifically to target these outcomes, they are known to be related to sexual risk behavior and should be considered as a possible mechanism of the intervention. We assessed illegal drug use and employment status at each interview. At baseline, we asked participants about their drug use and employment status prior to incarceration. In the follow-up interviews, we assessed drug use over the past 3 months.

We assessed psychosocial constructs through scales previously used with women prisoners.³² We assessed HIV knowledge with an 18-item questionnaire ($\alpha = 0.70$)³³ and barriers to protection with the Condom Barriers Scale (comprises total scale [$\alpha = 0.91$] and Access [$\alpha = 0.78$], Partner [$\alpha = 0.90$], Physical Effect [$\alpha = 0.80$], and Motivation [$\alpha = 0.68$] subscales)³⁴ and the 4-item Barriers To Sexual Protective Practices Scale ($\alpha = 0.76$).³⁵ Other psychosocial measures were self-efficacy for condom use, measured by a 4-item condom self-efficacy questionnaire created for this study ($\alpha = 0.80$); Health-Protective Sexual Communication Scale ($\alpha = 0.87$)³⁶; depressive symptoms, assessed with the Center for Epidemiological Studies Depression Scale ($\alpha = 0.89$)³⁷; and recent experiences of partner violence, assessed with the 30-item Index of Spouse Abuse ($\alpha = 0.92$ for physical and 0.95 for nonphysical abuse).³⁸ We measured feelings of power in recent relationships with the 8-item Power and Relationships Scale ($\alpha = 0.84$).³⁹

Statistical Analysis

We analyzed participants' outcomes relative to their assigned study arm and regardless of number of sessions attended. We designed the study to have at least 80% power at a .05 significance level to reject the null hypothesis that STI incidence rates (gonorrhea, chlamydia, and trichomonas) were the same for the POWER and control arms; this provided adequate power for other study outcomes as well. However, not all women were tested (and subsequently treated if positive) for trichomonas on admission, so we were unable to separate previous infection from infection occurring after release. Therefore, we excluded trichomonas as an STI outcome. Because of this, the study was underpowered to detect an intervention effect on the biological outcome, but power for other study outcomes was unaffected. We used SAS version 9.2 (SAS Institute Inc, Cary, NC) for all data analysis.

We described the sample at baseline with respect to sociodemographic variables, sexual risk behaviors, STIs, and psychosocial constructs. We assessed differences by assigned study condition by *t* test for continuous variables and χ^2 test for dichotomous or categorical variables. We assessed intervention efficacy with mixed-effects models. We fit logistic mixed-effects models for dichotomous outcomes, negative binomial models with a log-link function for count outcomes (e.g., number of sexual partners and number of unprotected sexual acts), and linear mixed models for the continuous psychosocial outcomes.

Mixed models controlled for the baseline value of the outcome (except for biological outcomes, which we did not assess at the baseline interview) and included fixed effects for time point and intervention (treatment group). A random intercept allowed for within-participant correlation between time 2 (3-month follow-up) and time 3 (6-month follow-up). We also included a time \times treatment interaction to estimate a separate treatment effect for time 2 and time 3. We expressed intervention effects for dichotomous outcomes as adjusted odds ratios (AORs) and 95% confidence intervals (CIs); we expressed effects for count outcomes as model-estimated differences in predicted counts and 95% CIs.

RESULTS

Table 1 summarizes baseline demographic and outcome data for the 2 study arms. Women in the study averaged 33.8 years of age (SD = 9.21; range = 18–60). Many were White

(57.8%); 7 women (1.3%) were Latina. More than half (58.3%) reported being a high school graduate, 61.0% earned less than \$18 000 per year, 58.0% received government assistance, and 46.8% were unemployed prior to incarceration. On average, women supported up to 3 people with their income. More than a third of the women had never married, and the average number of live births was 2. Nearly 60% reported use of illegal drugs during the 30 days before incarceration. More than a third of participants (37.6%) had previously been incarcerated, and the same percentage reported that their current incarceration was drug related.

Nearly three quarters (72.6%) of participants reported engaging in unprotected vaginal intercourse in a nonmonogamous relationship, 25.3% reported any condom use with main partners, and 28.6% reported condom use with nonmain partners. About 20% of the sample reported partner concurrency, and 12.9% reported trading sex. Approximately half the women (50.3%) reported ever having an STI, and 4.0% were diagnosed and treated for chlamydia or gonorrhea at admission. Women randomized to the intervention reported significantly greater physical and non-physical spousal abuse than control participants ($P < .01$); we observed no other significant differences (Table 1).

Of 265 women assigned to the intervention arm, 179 (68%) and 158 (60%) completed the 3-month and 6-month postrelease assessments, respectively (Figure A). The average number of POWER sessions attended was 5.8, and only 34 women (12.8%) did not attend any of the intervention sessions. Of 256 women assigned to the control arm, 155 (61%) and 142 (55%) completed the 3- and 6-month postrelease assessments, respectively. The 3-month follow-up occurred an average of 13 weeks after release (range = 9–31 weeks), and the 6-month follow-up occurred an average of 26 weeks after release (range = 22–43 weeks). In the intervention arm, the average 3-month follow-up occurred 2 weeks after the final phone call (range = 0–4 weeks). We observed no significant intervention differences in proportion of participants lost to follow-up ($\chi^2[1] = 2.11$; $P = .15$). Women with no follow-up data reported significantly more illegal drug use at baseline than did those with follow-up data; the groups had no other baseline differences in demographics or study outcomes.

Sexual Risk Behaviors

Tables 2 and 3 summarize intervention effects on sexual risk behaviors measured at 3 and 6 months after release. Table 2 presents the results of logistic mixed models for dichotomous outcomes. At 6 months after release, POWER participants had 43% lower odds of reporting unprotected vaginal intercourse outside of monogamous relationships (AOR = 0.57; 95% CI = 0.35, 0.92) and more than twice the odds of condom use during vaginal intercourse with their main male partner (AOR = 2.06; 95% CI = 1.14, 3.72) relative to control participants. The intervention exerted no significant effects on the other dichotomous sexual risk behavior outcomes: condom use with nonmain male partner, partner concurrency, drug use before sexual intercourse, and trading sex. Likewise, we found no significant intervention effect on incident nonviral STIs.

Table 3 presents the results of negative binomial mixed-effects models on count outcomes. The intervention had no statistically significant effects, but the effect on number of male

sexual partners approached significance: POWER participants reported fewer male sexual partners at 3 and 6 months after release ($P = .1$ and $.11$, respectively).

Psychosocial Constructs

The intervention had several significant effects on psychosocial constructs (Table 4). POWER participants at 3 months after release reported significantly more HIV knowledge ($b = 0.71$; $P < .01$) and health-protective communication ($b = 1.04$; $P < .05$), fewer motivational barriers to condom use ($b = -0.13$; $P < .05$), and less physical spousal abuse ($b = -2.64$; $P < .05$) than did control participants.

At 6 months after release, POWER participants continued to report greater HIV knowledge ($b = 0.76$; $P < .01$) and fewer motivational barriers to condom use ($b = -0.20$; $P < .01$) than did women in the control group. POWER participants also reported significantly fewer partner barriers and physical effect barriers to condoms and greater tangible social support at the 6-month follow-up.

DISCUSSION

POWER provides an evidence-based curriculum adapted to the specific needs of incarcerated women, thereby addressing a key gap in the HIV–STI prevention portfolio for women in prison.²¹ In addition, POWER provides important resources for reentry and the transition of women back into their communities of origin.⁴⁰ These include setting goals for reentry, finding employment and housing, resume writing, job interviewing, and disclosure of incarceration status.

At 6 months after release from prison, POWER participants reported a significant reduction in unprotected vaginal intercourse outside of a monogamous relationship and significantly greater condom use with main male sexual partners than did control participants. Although not statistically significant, POWER participants reported a reduction in number of male sexual partners at 3 months after release. We also observed favorable changes in psychosocial constructs, including significant increases in HIV knowledge, health-protective communication, and tangible social support and significant reductions in condom use barriers and spousal abuse. It is important to acknowledge that these significant changes in behaviors occurred after women were released from prison and during their reentry into their communities. POWER participants' baseline levels of depression, sexual network risk, and number of stressors were similar to those of control group participants; thus the detection of significant intervention effects is remarkable because many of these women returned to high-risk sexual partnerships and risky sexual and substance use situations after release.

The original SAFE intervention significantly reduced unprotected vaginal intercourse with male partners and number of sexual partners, as well as incident nonviral STIs, including chlamydia and gonorrhea infections, among women in public health clinics.^{23,24} The POWER intervention, adapted to address the HIV–STI prevention needs of incarcerated women and delivered to women while in prison, was also efficacious in reducing sexual risk behaviors. However, there are plausible reasons why our study did not replicate SAFE's intervention effects on STI outcomes.

The samples of the SAFE and POWER trials differed in important aspects. SAFE was evaluated among minority women in public health clinics with diagnosed nonviral STIs (gonorrhea, syphilis, and chlamydia).²³ By contrast, only 4% of the incarcerated women enrolled in POWER were diagnosed with nonviral STIs (chlamydia or gonorrhea) at prison intake. POWER was statistically powered to detect intervention effects on nonviral STIs including trichomonas, but issues with trichomonas reporting by the North Carolina Correctional Institute for Women barred our use of that outcome and underpowered the study for the STI outcome. Finally, the SAFE study conducted assessments at 12 and 24 months after the intervention, providing a lengthy follow-up period for women to engage in sexual risk behaviors leading to detectable incident STIs. By contrast, we conducted shorter follow-up assessments (3 and 6 months after release) because of constraints in tracking women after their release from prison.

Limitations

Retention of participants at follow-up assessments was low, thereby reducing power to detect significant intervention effects. Low retention of incarcerated populations in intervention trials is common,⁴¹ and the women enrolled in POWER reentered communities throughout North Carolina, making tracking and retention particularly difficult. Furthermore, women who reported more illegal drug use at baseline were more likely to be lost to follow-up, minimizing the intervention's potential impact on drug users. Presumably, the women who had less stability upon release were those unable to be contacted for follow-up; 97% of those interviewed at 3 months after release reported stable housing.

Another methodological limitation was that the single-session control intervention focused on STI prevention, rather than serving as a true placebo to guard against Hawthorne effects. Future studies would benefit from inclusion of a time-equivalent comparison condition focusing on other health-related topics. In addition, the concurrent nature of the intervention and control conditions in the prison increased the potential for cross-contamination. However, in light of the closed nature of the POWER sessions, the advantages of randomizing each participant outweighed the risk of cross-contamination bias. Finally, the trial findings may not generalize to women incarcerated in large urban areas or other regions of the United States.

Conclusions

Our study demonstrated that a multiple-session HIV–STI prevention intervention adapted for and delivered to women in prison can significantly reduce sexual risk behaviors and increase protective behaviors after reentry into the community. Although POWER was developed for HIV-negative women, it could be adapted to develop behavioral interventions to meet the unique HIV–STI prevention, care, and treatment needs of the thousands of HIV-positive women who are released from correctional facilities annually.⁸

Prisons provide an opportunity to deliver behavioral interventions to a population at high risk of acquiring or transmitting HIV and STIs.²⁷ POWER may be an important component of a comprehensive portfolio of services (e.g., substance use and mental health treatment,

housing assistance, and intimate partner violence prevention) to meet the complex needs of women involved in the criminal justice system.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

This study was funded by the CDC (cooperative agreement 5UR6PS000670). Catherine I. Fogel received support from the UNC Center for AIDS Research (grant P30AI0410). The POWER intervention videos were updated with support from The North Carolina Translational and Clinical Sciences Institute.

We thank the women who participated in the study for their important contributions to the fight against HIV/AIDS.

Note. The findings and conclusions in this article are those of the authors and do not necessarily represent the official position of the CDC.

References

- Centers for Disease Control and Prevention. HIV Surveillance Report 2011. Vol. Vol. 23. Atlanta, GA: US Dept of Health and Human Services; 2013. Available at: http://www.cdc.gov/hiv/library/reports/surveillance/2011/surveillance_report_vol_23.html. [Accessed May 21, 2014]
- Centers for Disease Control and Prevention. Fact Sheet: HIV Among Women. Atlanta, GA: US Dept of Health and Human Services; 2014. Available at: www.cdc.gov/hiv/pdf/risk_women.pdf. [Accessed 21 May 2014]
- Bernstein KT, Chow JM, Ruiz J, et al. *Chlamydia trachomatis* and *Neisseria gonorrhea* infections among men and women entering California prisons. *Am J Public Health*. 2006; 96(10):1862–1866. [PubMed: 17008584]
- Centers for Disease Control and Prevention. Sexually Transmitted Disease Surveillance 2011. Atlanta, GA: US Dept of Health and Human Services; 2013. Available at: <http://www.cdc.gov/std/stats11/default.htm>. [Accessed May 21, 2014]
- Kouyoumdjian FG, Leto D, John S, Henein H, Bondy s. A systematic review and meta-analysis of the prevalence of chlamydia, gonorrhoea and syphilis in incarcerated persons. *Int J STD AIDS*. 2012; 23(4):248–254. [PubMed: 22581947]
- Centers for Disease Control and Prevention. HIV Surveillance Report, 2010. Vol. 22. Atlanta, GA: US Dept of Health and Human Services; 2012; Available at: http://www.cdc.gov/hiv/surveillance/resources/reports/2010report/pdf/2010_HIV_Surveillance_Report_vol_22.pdf. [Accessed May 21, 2014]
- Centers for Disease Control and Prevention. STDs in Persons Entering Corrections Facilities. Atlanta, GA: US Dept of Health and Human Services; 2011. Available at: <http://www.cdc.gov/std/stats10/corrections.htm>. [Accessed May 21, 2014]
- Spaulding AC, Seals RM, Page MJ, Brzozowski AK, Rhodes W, Hammett TM. HIV/AIDS among inmates of and releasees from US correctional facilities, 2006: declining share of epidemic but persistent public health opportunity. *PLoS ONE*. 2009; 4(11):e7558. [PubMed: 19907649]
- Parvez F, Katyal M, Alper H, Leibowitz R, Venters H. Female sex workers incarcerated in New York City jails: prevalence of sexually transmitted infections and associated risk behaviors. *Sex Transm Infect*. 2013; 89(4):280–284. [PubMed: 23687128]
- Rogers SM, Khan MR, Tan S, Turner CF, Miller WC, Erbedding E. Incarceration, high-risk sexual partnerships and sexually transmitted infections in an urban population. *Sex Transm Infect*. 2012; 88(1):63–68. [PubMed: 22250181]
- Swan H, O'Connell DJ. The impact of intimate partner violence on women's condom negotiation efficacy. *J Interpers Violence*. 2012; 27(4):775–792. [PubMed: 21987514]

12. Harp KLH, Oser C, Leukefeld C. Social support and crack/cocaine use among incarcerated mothers and nonmothers. *Subst Use Misuse*. 2012; 47(6):686–694. [PubMed: 22468988]
13. Catz SL, Thibodeau L, BlueSpruce J, et al. Prevention needs of HIV-positive men and women awaiting release from prison. *AIDS Behav*. 2012; 16(1):108–120. [PubMed: 21553252]
14. Kramer K, Comfort M. Considerations in HIV prevention for women affected by the criminal justice system. *Womens Health Issues*. 2011; 21 suppl(6):S272–S277. [PubMed: 21782463]
15. Khan MR, Miller WC, Schoenbach VJ, et al. Timing and duration of incarceration and high-risk sexual partnerships among African Americans in North Carolina. *Ann Epidemiol*. 2008; 18(5): 403–410. [PubMed: 18395464]
16. Luther JB, Reichert ES, Holloway ED, Roth AM, Aalsma MCA. An exploration of community reentry needs and services for prisoners: a focus on care to limit return to high-risk behavior. *AIDS Patient Care STDS*. 2011; 25(8):475–481. [PubMed: 21663540]
17. Bradley RG, Davino KM. Women's perceptions of the prison environment: when prison is "the safest place I've ever been." *Psychol Women Q*. 2002; 26(4):351–359.
18. Rapposelli KK, Kennedy MG, Miles JR, et al. HIV/AIDS in correctional settings: a salient priority for the CDC and HRSA. *AIDSEduc Prev*. 2002; 14(5 suppl):103–113.
19. Lichtenstein B, Malow R. A critical review of HIV-related interventions for women prisoners in the United States. *J Assoc Nurses AIDS Care*. 2010; 21(5):380–394. [PubMed: 20350816]
20. Hogben M, St Lawrence J. HIV/STD risk reduction interventions in prison settings. *J Womens Health Gend Based Med*. 2000; 9(6):587–592. [PubMed: 10957746]
21. Centers for Disease Control and Prevention. Compendium of Evidence-Based HIV Prevention Interventions. Atlanta, GA: US Dept of Health and Human Services; 2014. Available at: <http://www.cdc.gov/hiv/topics/research/prs/subset-best-evidence-interventions.htm#link4.1>. [Accessed May 21, 2014]
22. Fasula AM, Fogel CI, Gelaude D, Carry M, Gaiter J, Parker S. Project POWER: adapting an evidence-based HIV/STI prevention intervention for incarcerated women. *AIDS Educ Prev*. 2013; 25(3):203–215. [PubMed: 23631715]
23. Shain RN, Piper JM, Newton ER, et al. A randomized, controlled trial of a behavioral intervention to prevent sexually transmitted disease among minority women. *N Engl J Med*. 1999; 340(2):93–100. [PubMed: 9887160]
24. Shain RN, Piper JM, Holden AEC, et al. Prevention of gonorrhea and chlamydia through behavioral intervention: results of a two-year controlled randomized trial in minority women. *Sex Transm Dis*. 2004; 31(7):401–408. [PubMed: 15215694]
25. McKleroy VS, Galbraith JS, Cummings B, et al. Adapting evidence-based behavioral interventions for new settings and target populations. *AIDS Educ Prev*. 2006; 18(4)(suppl A):59–73. [PubMed: 16987089]
26. Centers for Disease Control and Prevention. PS07– 004: Adopting and Demonstrating the Adaptation of Prevention Techniques for Persons at Highest Risk of Acquiring or Transmitting Human Immunodeficiency Virus (ADAPT-2). Atlanta, GA: US Dept of Health and Human Services; 2007.
27. Abad N, Carry M, Herbst JH, Fogel CI. Motivation to reduce risk behaviors while in prison: qualitative analysis of interviews with current and formerly incarcerated women. *J Qual Crim Justice Criminol*. 2013; 1(2):347–363.
28. Fogel CI, Gelaude D, Carry M, et al. Context of risk for HIV and sexually transmitted infections among incarcerated women in the South: Individual, interpersonal and societal factors. *Women Health*. 2014; 54(8)
29. Catania JA, Kegeles S, Coates TJ. Towards an understanding of risk behavior: an AIDS risk reduction model (ARRM). *Health Educ Q*. 1990; 17(1):53–72. [PubMed: 2318652]
30. National Institute on Drug Abuse. Risk Behavior Assessment—Revised. Rockville, MD: National Institute on Drug Abuse; 1993.
31. Manhart LE, Aral SO, Holmes KK, Foxman B. Sex partner concurrency: measurement, prevalence, and correlates among urban 18–39-year-olds. *Sex Transm Dis*. 2002; 29(3):133–143. [PubMed: 11875374]

32. Fogel, CI. Exploring Incarcerated Women's Risky Sexual Behaviors and Sexual Protective Practices. Charleston, SC: Southern Nursing Research Society; 1999.
33. Carey MP, Schroder KEE. Development and psychometric evaluation of the brief HIV Knowledge Questionnaire. *AIDS Educ Prev.* 2002; 14(2):172–182. [PubMed: 12000234]
34. St Lawrence JS, Chapdelaine AP, Devieux JG, OBannon RE3rd, Brasfield TL, Eldridge GD. Measuring perceived barriers to condom use: psychometric evaluation of the Condom Barriers Scale. *Assessment.* 1999; 6(4):391–404. [PubMed: 10539985]
35. Parker B, McFarlane J, Soeken K, Torres S, Campbell D. Physical and emotional abuse in pregnancy: a comparison of adult and adolescent women. *Nurs Res.* 1993; 42(3):173–178. [PubMed: 8506167]
36. Catania, J.; Davis, C.; Yarber, W.; Davis, S.; Catania, JA. Health Protective Sexual Communication Scale. In: Davis, C.; Yarber, W.; Davis, S., editors. *Handbook of Sexuality-Related Measures.* Thousand Oaks, CA: Sage; 1998. p. 544-547.
37. Radloff LS. The CES-D scale: a self-report depression scale for use in the general population. *Appl Psychol Meas.* 1997; 1:385–401.
38. Hudson WW, McIntosh SR. The assessment of spouse abuse: two quantifiable dimensions. *J Marriage Fam.* 1981; 43:873–888.
39. Connell, RW. *Gender and Power.* Stanford, CA: Stanford University Press; 1987.
40. Westergaard RP, Spaulding AC, Flanigan TP. HIV among persons incarcerated in the USA: a review of evolving concepts in testing, treatment, and linkage to community care. *Curr Opin Infect Dis.* 2013; 26(1):10–16. [PubMed: 23221766]
41. Goshin LS, Byrne MW. Predictors of post-release research retention and subsequent reenrollment for women recruited while incarcerated. *Res Nurs Health.* 2012; 35(1):94–104. [PubMed: 22105494]

TABLE 1

Demographic and Other Baseline Characteristics of Intervention and Control Groups of Incarcerated Women: Providing Opportunities for Women's Empowerment, Risk-Reduction, and Relationships, North Carolina, 2010–2012

Characteristic	POWER (n= 265), Mean \pm SD or No. (%)	Control (n = 256), Mean \pm SD or No. (%)	t Test or χ^2 Test (P)
Age at baseline visit, y	34.2 \pm 9.20	33.4 \pm 9.23	1.06 (.29)
Latina ethnicity	6 (2.0)	1 (0.4)	3.45 (.06)
Race			6.78 (.24)
White	143 (54.0)	158 (61.7)	
Black/African American	95 (35.8)	82 (32.0)	
Asian	1 (0.3)	0 (0)	
Native American	5 (1.8)	5 (2.0)	
Multiracial	12 (4.5)	6 (2.3)	
Other	8 (3.0)	3 (1.2)	
Unknown/not reported	1 (0.3)	2 (0.8)	
High school graduate	159 (60.0)	145 (56.6)	0.60 (.44)
Income < \$18 000/y	159 (60.0)	159 (62.1)	0.24 (.62)
People supported by income, no.	2.7 \pm 1.57	2.7 \pm 1.57	0.17 (.86)
Never married	102 (38.5)	87 (34.0)	5.64 (.46)
Receive government assistance (welfare, food stamps)	149 (56.2)	153 (59.8)	0.67 (.41)
Unemployed before incarceration	115 (43.4)	129 (50.4)	2.56 (.11)
Births, no.	2.3 \pm 1.42	2.4 \pm 1.39	1.14 (.25)
Children in household, no.	1.2 \pm 1.44	1.4 \pm 1.49	1.10 (.27)
Alcohol use in 30 d before incarceration	169 (63.8)	145 (56.6)	2.77 (.1)
Drug use (not including alcohol or marijuana) in 30 d before incarceration	157 (59.4)	147 (57.4)	0.18 (.67)
Incarceration history			
Previously incarcerated	95 (35.8)	101 (39.5)	0.72 (.4)
Previous times in prison, no.	2.2 \pm 1.84	2.5 \pm 2.56	1.04 (.23)
Previous times in jail, no.	6.9 \pm 7.00	7.6 \pm 8.47	0.73 (.47)
Current offense drug-related	104 (39.3)	92 (35.9)	0.61 (.44)
Sexual risk behaviors (past 3 mo)			
Unprotected vaginal intercourse outside of monogamous relationship	194 (73.2)	184 (71.9)	0.01 (.9)
Condom use during vaginal intercourse with main male partner ^a	64 (24.1)	68 (26.6)	0.68 (.41)
Condom use during vaginal intercourse with nonmain male partner ^b	15 (31.3)	11 (25.6)	0.36 (.55)
Partner concurrency ^c	54 (20.4)	48 (18.8)	0.24 (.62)
Traded sex	33 (12.5)	34 (13.3)	0.20 (.5)
Times traded sex (among those who traded), no.	6.9 \pm 22.4	4.2 \pm 17.2	–1.15 (.25)
Used drugs before sexual intercourse	123 (46.4)	101 (39.5)	2.59 (.11)
Unprotected vaginal intercourse acts, no.	13.8 \pm 19.6	14.6 \pm 18.6	0.46 (.65)
Male sexual partners, no.	3.3 \pm 13.3	2.1 \pm 6.9	–1.26 (.21)
Sexually transmitted infections			

Characteristic	POWER (n= 265), Mean \pm SD or No. (%)	Control (n = 256), Mean \pm SD or No. (%)	<i>t</i> Test or χ^2 Test (<i>P</i>)
Self-reported ever had STI	140 (52.8)	122 (47.7)	1.51 (.22)
Laboratory diagnosed chlamydia or gonorrhea ^d	10 (3.8)	11 (4.3)	0.09 (.83)
HIV knowledge	14.1 \pm 2.44	14.1 \pm 2.50	-0.22 (.83)
Condom barriers	2.3 \pm 0.43	2.3 \pm 0.50	-1.04 (.3)
Access	2.0 \pm 0.40	2.0 \pm 0.45	-0.02 (.99)
Partner	2.4 \pm 0.71	2.3 \pm 0.72	-1.77 (.08)
Effect	2.5 \pm 0.64	2.5 \pm 0.70	-0.19 (.85)
Motivation	2.4 \pm 0.53	2.3 \pm 0.58	-0.85 (.4)
Condom self-efficacy	4.4 \pm 0.72	4.4 \pm 0.76	0.44 (.66)
Barriers to sexual protective practices	7.9 \pm 2.21	7.8 \pm 2.16	-0.24 (.81)
Health-Protective Communication Scale	39.4 \pm 5.50	39.9 \pm 5.58	0.93 (.35)
Depression	168 (63.4)	177 (69.1)	1.92 (.17)
Social support	4.1 \pm 0.93	4.2 \pm 0.80	1.38 (.17)
Emotional/informational support	4.0 \pm 1.03	4.1 \pm 0.87	1.47 (.14)
Tangible support	4.1 \pm 1.07	4.1 \pm 0.95	1.11 (.27)
Affectionate support	4.3 \pm 0.97	4.4 \pm 0.82	0.94 (.35)
Positive social interaction	4.1 \pm 0.99	4.2 \pm 0.83	1.17 (.24)
Social network risk	3.6 \pm 0.38	3.7 \pm 0.35	1.47 (.14)
Stressors, no.	6.9 \pm 4.68	6.2 \pm 4.43	-1.78 (.08)
Physical Index of Spouse Abuse	11.2 \pm 17.20	7.5 (\pm 4.21)	-2.7 (.007)
Nonphysical Index of Spouse Abuse	15.3 \pm 20.63	10.3 \pm 15.79	-3.1 (.002)
Power and attitudes in relationships	3.1 \pm 0.37	3.1 \pm 0.36	-0.5 (.63)

Note. POWER = Providing Opportunities for Women's Empowerment, Risk-Reduction, and Relationships; STI = sexually transmitted infection.

^a Among participants who reported vaginal intercourse with main partner (n = 437; 225 intervention and 212 control).

^b Among participants who reported vaginal intercourse with nonmain partner (n = 91; 48 intervention and 43 control).

^c Defined as having more than 1 male sexual partner during any 1 week out of the 4 weeks prior to incarceration.

^d Two POWER participants did not provide data on baseline STIs.

TABLE 2

Intervention Effects on Dichotomous Sexual Risk Behavior and Sexually Transmitted Infection Outcomes After Release From Prison: Providing Opportunities for Women's Empowerment, Risk-Reduction, and Relationships, North Carolina, 2010–2012

Outcome (Past 3 Months)	3 Months After Release			6 Months After Release		
	POWER, %	Control, %	Model AOR (95% CI)	POWER, %	Control, %	Model AOR (95% CI)
Sexual risk behavior						
Unprotected vaginal intercourse outside of monogamous relationship	47.4	56.7	0.67 (0.42, 1.08)	45.8	59.3	0.57* (0.35, 0.92)
Condom use during vaginal intercourse with main partner ^a	56.3	48.3	1.60 (0.92, 2.79)	61.5	50.9	2.06* (1.14, 3.72)
Condom use during vaginal intercourse with nonmain partner ^b	28.6	18.8	1.75 (0.36, 8.51)	6.3	14.3	0.38 (0.04, 4.02)
Partner concurrency	5.9	9.7	0.53 (0.22, 1.26)	6.5	10.7	0.56 (0.23, 1.34)
Drugs before intercourse	15.2	11.8	1.39 (0.68, 2.85)	11.0	11.4	1.00 (0.47, 2.11)
Traded sex	3.5	3.5	1.01 (0.32, 3.19)	2.0	5.7	0.36 (0.10, 1.33)
Any chlamydia or gonorrhea diagnosis	6.8	4.6	1.38 (0.54, 3.55)	5.8	4.4	1.34 (0.48, 3.72)
Use of drugs (not including alcohol or marijuana)	10.6	14.8	0.66 (0.34, 1.27)	9.5	16.2	0.63 (0.31, 1.28)
Unemployed	77.8	73.1	1.33 (0.78, 2.26)	77.9	72.9	1.41 (0.82, 2.42)

Note. AOR = adjusted odds ratio; CI = confidence interval; POWER = Providing Opportunities for Women's Empowerment, Risk-Reduction, and Relationships; STI = sexually transmitted infection. AOR derived from logistic mixed-effects models adjusted for baseline outcome value; reference category was standard-of-care control intervention.

^aThis model excluded participants who reported no partners at any follow-up visit; the sample consisted of 415 follow-up observations from 264 participants.

^bSample size was reduced considerably because not all participants reported having nonmain partners. This model used 74 follow-up observations from a total of 55 study participants; it also did not control for the baseline value of the outcome because requiring a nonmain partner at baseline did not allow sufficient sample size for model convergence.

* $P < .05$.

TABLE 3

Intervention Effects on Count Outcomes After Release From Prison: Providing Opportunities for Women’s Empowerment, Risk-Reduction, and Relationships, North Carolina, 2010–2012

Outcome	3 Months After Release			6 Months After Release		
	POWER, Mean (SD)	Control, Mean (SD)	Model-Adjusted Difference ^a (95% CI)	POWER, Mean (SD)	Control, Mean (SD)	Model-Adjusted Difference ^a (95% CI)
Unprotected sexual acts, no.	6.28 (13.6)	5.53 (9.09)	0.12 (−0.28, 0.52)	6.06 (12.4)	6.45 (11.9)	−0.20 (−0.68, 0.27)
Male sexual partners, no.	1.11 (1.3)	2.25 (12.4)	−0.71 (−1.55, 0.13)	1.00 (1.0)	2.24 (8.6)	−0.39 (−0.87, 0.08)

Note. CI = confidence interval; POWER = Providing Opportunities for Women’s Empowerment, Risk-Reduction, and Relationships.

^aExponentiated unstandardized regression parameter estimate derived from negative binomial models with a log-link function.

TABLE 4

Intervention Effects on Psychosocial Constructs After Release From Prison: Providing Opportunities for Women's Empowerment, Risk-Reduction, and Relationships, North Carolina, 2010–2012

Construct	3 Months After Release			6 Months After Release		
	POWER, Mean (SD)	Control, Mean (SD)	Model, b^a (SE)	POWER, Mean (SD)	Control, Mean (SD)	Model, b^a (SE)
HIV knowledge	15.1 (1.6)	14.4 (2.1)	0.71** (0.18)	15.2 (1.7)	14.4 (2.1)	0.76** (0.18)
Condom barriers	2.3 (0.4)	2.3 (0.4)	-0.08 (0.04)	2.2 (0.4)	2.4 (0.4)	-0.14* (0.04)
Subscales						
Access	2.0 (0.4)	2.1 (0.4)	-0.07 (0.04)	2.0 (0.3)	2.1 (0.4)	-0.06 (0.04)
Partner	2.4 (0.6)	2.4 (0.7)	-0.07 (0.06)	2.2 (0.5)	2.4 (0.6)	-0.14* (0.07)
Physical Effect	2.4 (0.6)	2.5 (0.6)	-0.07 (0.06)	2.4 (0.6)	2.6 (0.6)	-0.17** (0.06)
Motivation	2.2 (0.5)	2.4 (0.5)	-0.13* (0.05)	2.2 (0.5)	2.4 (0.5)	-0.20** (0.06)
Condom self-efficacy	4.6 (0.6)	4.5 (0.7)	0.11 (0.07)	4.7 (0.6)	4.5 (0.8)	0.13 (0.07)
Barriers to sexual protective practices	7.6 (2.0)	8.0 (2.0)	-0.37 (0.21)	7.6 (1.5)	8.1 (2.2)	-0.41 (0.22)
Health-Protective Communication Scale	40.5 (4.8)	39.6 (4.6)	1.04* (0.49)	39.9 (4.7)	39.7 (4.4)	-0.04 (0.50)
Depression	41.5 (15.1)	42.9 (16.6)	-1.24 (1.56)	40.0 (14.9)	41.7 (16.1)	-0.49 (1.60)
Social support	4.2 (0.9)	4.2 (0.9)	0.06 (0.09)	4.2 (0.9)	4.1 (0.9)	0.15 (0.09)
Emotional/Informational support	4.1 (1.0)	4.1 (0.9)	0.05 (0.10)	4.2 (1.0)	4.1 (1.0)	0.15 (0.10)
Tangible support	4.2 (0.9)	4.2 (0.9)	0.10 (0.10)	4.3 (0.9)	4.1 (1.0)	0.24* (0.10)
Affectionate support	4.4 (0.9)	4.3 (0.9)	0.06 (0.09)	4.4 (0.9)	4.3 (0.9)	0.06 (0.09)
Positive social interaction	4.2 (1.0)	4.2 (0.9)	-0.01 (0.10)	4.2 (1.0)	4.1 (1.0)	0.09 (0.10)
Social network risk	3.7 (0.4)	3.7 (0.3)	-0.01 (0.04)	3.7 (0.3)	3.7 (0.3)	-0.01 (0.04)
Stressors, no.	3.8 (3.3)	3.8 (3.3)	-0.21 (0.33)	3.6 (3.1)	3.9 (3.7)	-0.28 (0.33)
Physical Index of Spouse Abuse	2.8 (7.3)	5.2 (11.8)	-2.64* (1.29)	4.1 (11.1)	6.5 (16.1)	-2.41 (1.34)
Nonphysical Index of Spouse Abuse	6.8 (14.0)	8.5 (14.7)	-2.20 (1.71)	8.1 (16.1)	8.4 (16.8)	-0.45 (1.76)
Power and attitudes in relationships	3.1 (0.4)	3.1 (0.4)	0.06 (0.04)	3.1 (0.3)	3.1 (0.3)	-0.01 (0.05)

Note. POWER = Providing Opportunities for Women's Empowerment, Risk-Reduction, and Relationships.

^aUnstandardized regression parameter estimate derived from linear mixed models that controlled for baseline value of outcome and included fixed effects for time point and treatment group; reference category was standard-of-care control intervention.

.10' > P
**
'50' > P
*

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript